

REMARKS

The following remarks are offered in complete response to the Official Action dated January 18, 2011. In light of these remarks, reconsideration of the rejections and examination of all of the claimed subject matter on the merits are respectfully requested.

Claims 25-27, 29, 32, 33, 35, 36, 38, 41, 42 and 45-48 are pending in this application. Claims 1-24, 37 and 39 were previously cancelled without prejudice to or disclaimer of the subject matter therein. Claims 28, 30, 31, 34, 38, 40, 43, 44 and 48 were cancelled in this amendment without prejudice to our disclaimer of the subject matter therein.

Claim 25 has been amended to delete that the matrix can be a polyester matrix, to delete generic descriptions of the first additive, the second additive and the bifunctional monomer of formula (II), to delete that the bifunctional monomer of formula (II) is optional, to recite specific embodiments of these compounds and that the composition comprises reinforcing glass fibers. Support for this amendment is found in the specification and in previous versions of the claims. Claims 29 and 33 have been amended to delete various embodiments of the first additive or compounds of formulas (I) and (II), respectively. Claims 35 and 36 have been amended to delete Markush language and to delete various embodiments of the compounds of formulas (III) and (IV), respectively. Claim 46 has been amended to delete three embodiments of processes that may be used to shape the article.

No new matter has been added in making these amendments.

General Comments

The claims of the instant application are directed to a thermoplastic composition comprising a mixture of a polyamide matrix with:

- (i) a first additive selected from the group consisting of isophthalic acid, terephthalic acid, adipic acid, trimesic acid, 2,2,6,6-tetrakis (β -carboxyethyl)cyclohexanone, 3,5,3',5'-biphenyltetracarboxylic acid, 1,3,5,7-naphthalenetetracarboxylic acid, 3,5,3',5'-benzophenonetetracarboxylic acid, and 1,2,4,5-benzenetetracarboxylic acid; and

- (ii) a second additive (B) obtained by a reaction between at least:
- a) one compound of formula (III): R^3-Y (III)
selected from the group consisting of n-hexadecylamine, n-octadecylamine, n-dodecylamine, and benzylamine;
 - b) one branching compound of formula (IV): $Y-R^4-X_m$ (IV)
selected from the group consisting of 5-aminoisophthalic acid, 3,5-diaminobenzoic acid, 3,4-diaminobenzoic acid, and mixtures thereof;
 - c) optionally, one multifunctional compound of formula (I):
 R^1-X_n (I); and
 - d) one bifunctional monomer of formula (II) or a corresponding cyclic form: $X-R^2-Y$ (II)
selected from ϵ -caprolactam, the corresponding amino acid and mixtures thereof;

in which:

R^1 , R^2 , R^3 and/or R^4 represent, independently of each other, a hydrocarbon radical optionally comprising one or more heteroatoms;

X and Y are antagonist reactive functional groups capable of reacting with each other to form an amide bond;

n is an integer ranging from 3 to 50;

m is an integer ranging from 2 to 10;

and with the proviso that R, R^1 , R^2 , R^3 and R^4 do not comprise an amine, acid or alcohol functional group capable of forming an amide and/or ester bond, and

(iii) reinforcing glass fibers,

where the composition has: (1) smooth impact resistance and/or notched impact resistance greater than compositions having the same composition except for the second additive B, or (2) lower viscosity than compositions having the same composition except for the second additive B than compositions having the same composition except for the second additive B.

Table 2 in the specification provides the following comparison of properties of different compositions. C1 is blend of polyamide PA 66 and glass fibers. Components T2-T4 are additives encompassed by the first additive of the claims. T2 is isophthalic acid. T3 is trimesic acid, and T4 is 2,2,6,6-tetrakis(β -carboxyethyl)cyclohexanone. HBPA is a functionalized hyperbranched copolyamide, encompassed by the second additive of the claims. The compositions varied primarily by the additives present.

TABLE 2

Compositions and properties	C1	C2	C3	C4	C5	C6	7	8
PA 66	48.7	48.5	48.2	48.0	47.7	43.7	47.0	47.2
GF	50	50	50	50	50	50	50	50
T2		0.2		0.2			0.2	
T4			0.5	0.5			0.5	
T3								0.5
HBPA ex. 1					1.0	5.0	1.0	1.0
Impact resistance smooth at 23° C. (kJ/m ²) ISO 179-leU	90.8	73.6	80	78	82	88	88	93.4
Impact resistance notched at 23° C. (kJ/m ²) ISO 179-leA	13.6	9.6	10.5	10.0	12	13.4	13.0	12.2
Spiral length (mm)*	290	360	300	350	340	500	470	410
Modulus	16100	16700	16100	16100	16400	16400	16400	16800
Tension at 23° C. (N/mm ²) ISO 527								
Surface appearance	0	+	0	+	-	--	+	++

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A comparison of compositions C1-C4 with compositions 7 and 8 is shown below. C1 is blend of polyamide PA 66 and glass fibers. T2 is isophthalic acid. T3 is trimesic acid and T4 is 2,2,6,6-tetrakis(β -carboxyethyl)cyclohexanone. HBPA is a functionalized hyperbranched copolyamide, the second additive of the claims.

Compositions and properties	C1	C2	C3	C4	7	8
PA 66	48.7	48.5	48.2	48.0	47.0	47.2
GF	50	50	50	50	50	50
T2		0.2		0.2	0.2	
T4			0.5	0.5	0.5	
T3						0.5
HBPA ex. 1					1.0	1.0
Impact resistance smooth at 23° C. (kJ/m ²) ISO 179-leU	90.8	73.6	80	78	88	93.4
Impact resistance notched at 23° C. (kJ/m ²) ISO 179-leA	13.6	9.6	10.5	10.0	13.0	12.2
Spiral length (mm)*	290	360	300	350	470	410
Modulus	16 100	16700	16100	16100	16400	16800
Tension at 23° C. (N/mm ²) ISO 527						
Surface appearance	0	+	0	+	+	++
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The presence of the additives T2 and T4, either alone or in combination, lowers the smooth impact resistance from about 91 kJ/m² in C1, without any additive, to about 74-80 kJ/m², with the additives. Additives T2 and T4 correspond to the first additive B of the instant claims. However, compositions 7 and 8, which contain both the first and second additives of the instant claims, allowed the compositions to retain or increase the smooth impact resistance. (88-93.4 kJ/m²)

Similar results were obtained with the notched impact resistance. The presence of additives T2 and T4, either alone or in combination, lowers the notched impact resistance from about 13.6 kJ/m² in C1, without any additive, to about 9.6-10.5 kJ/m², with the additives. Additives T2 and T4 correspond to the first additive of

the instant claims. However, compositions 7 and 8, which contain both the first and second additives of the instant claims, allowed the compositions to retain or increase the notched impact resistance. (12.2-13.0 kJ/m²).

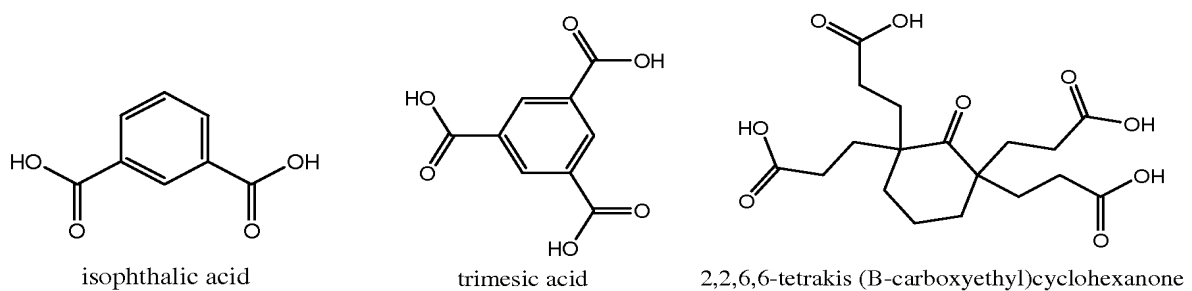
The presence of additives T2 and T4, either alone or in combination, increased the spiral length (lowered the viscosity) from about 290 mm, without any additive, to about 300-360 mm, with the additives. Additives T2 and T4 correspond to the first additive of the instant claims. However, compositions 7 and 8, which contain both the first and second additives of the instant claims, allowed the compositions to increase the spiral length to 410-470 mm. The Official Action indicates that the lowering of the viscosity is not in an unexpected amount. While the Official Action indicates that the two additives are low molecular weight compounds compared to the polyamide matrix and would be expected to lower the viscosity, this does not provide support for the amount that the viscosity would be lowered. An evaluation of the results shown in Table 2 shows that the magnitude of the change was not expected. Composition C1, which did not have any additives, had a spiral length of 290 mm. The addition of 0.2 parts of additive T2 to C1 increased the spiral length to 360 mm. However, when 0.5 parts of additive T4 (2.5 times the amount of T2) were added to C1, the spiral length only increased from 290 to 300 mm. When both additives T2 and T4 were added to C1 (C4), the spiral length of was only 350 mm, which is 10 mm less than C2, which only had 0.2 parts of T2. This data demonstrates that, contrary to the position taken by the Official Action, the addition of two low molecular weight compounds to the polyamide composition would not be expected to lower the viscosity.

The use of additives T2 and T4 (the first additive B of the claims) resulted in lower smooth impact resistance and notched impact resistance, while increasing the spiral length (lowering the viscosity). The addition of the HBPA additive (the second additive of the claims) allowed the composition to maintain or increase both the smooth impact resistance and the notched impact resistance, while providing a greater spiral length (lower viscosity) to the composition.

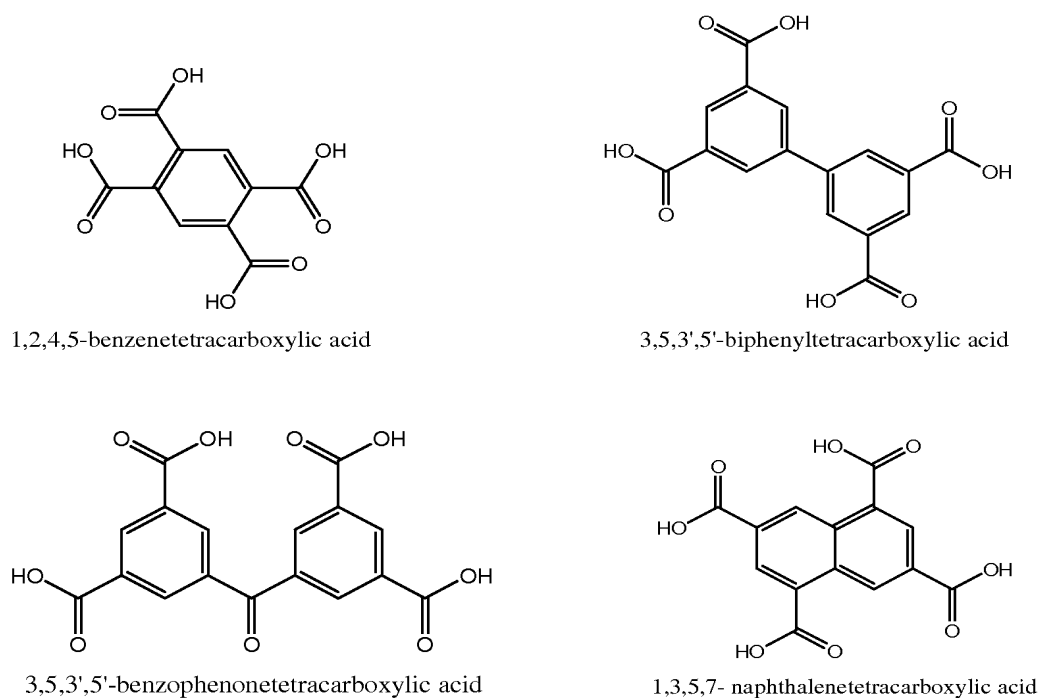
There is nothing in the cited prior art that would indicate that the decrease in both the smooth and notched impact resistance from the use of additives T2 and T4,

the second additives of the instant claims, could be overcome by the addition of HBPA (the second additive of the instant claims).

The Official Action states that the unexpected results must be shown for the full breadth of each genus. With regard to the matrix, the instant claims recite a polyamide matrix. The polyester matrix has been cancelled. With regard to the first additive (i), the comparative tests used isophthalic acid (T2), trimesic acid (T3) and 2,2,6,6-tetrakis(β -carboxyethyl)cyclohexanone (T4). The structures of these compounds are shown below:

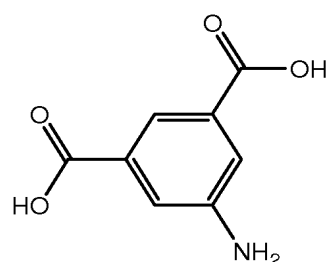


The claims have been amended to recite that the first additive is selected from the group of compounds consisting of the three compounds used in the comparative test and the four compounds below, which are structurally similar to the compounds used in the comparative test:

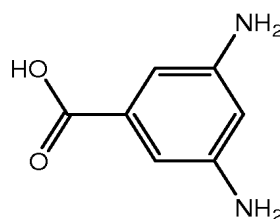


With regard to the compounds of formula (III), the claims have been amended to recite that the compound of formula (III) is selected from the group consisting of n-hexadecylamine, n-octadecylamine, n-dodecylamine, and benzylamine. One of ordinary skill in the art would recognize that the compounds would be expected to have similar properties.

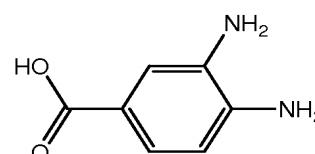
With regard to the compounds of formula (IV), the claims have been amended to recite that the compounds of formula (IV) are selected from the group consisting of the following compounds:



5-aminoisophthalic acid



3,5-diaminobenzoic acid



3,4-diaminobenzoic acid

Each of these compounds comprises a phenyl group having at least one amino group and at least one amine group. One of ordinary skill in the art would recognize that the compounds would be expected to have similar properties.

Rejection under 35 U.S.C. §103

The Official Action rejects claims 25-36, 38 and 40-48 under 35 U.S.C. §103(a) as allegedly being obvious over French Patent Document No. FR 2 833 603 (*FR '603*) in view of U.S. Patent No. 6,319,575 (*Takashima et al.*).

Applicants respectfully submit that claims 25-27, 29, 32,33,35, 36, 38 41, 42 and 45-48 are not obvious over French Patent Document No. FR 2 833 603 (*FR '603*) in view of U.S. Patent No. 6,319,575 (*Takashima et al.*).

To establish a *prima facie* case of obviousness, three basic criteria must be met. (MPEP §2143) First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

FR '603 relates to a thermoplastic polymeric composition including a hyperbranched polyamide, and articles formed from such composition. (See page 1 of machine translation.) *FR '603* does not disclose or suggest each feature recited in independent claim 25. For example, *FR '603* does not disclose or suggest a thermoplastic composition comprising a mixture of a polyamide matrix with at least: (i) a first additive of formula $R-Z_u$, as recited in claim 25. *FR '603* has no disclosure or suggestion of the recited first additive. The previous Official Action acknowledged this deficiency of *FR '603* at page 3, # (6).

The Official Action relies on *Takashima et al* for disclosing the use of a tricarboxylic acid compound including trimesic acid. The Official Action notes that *Takashima et al* teaches that tricarboxylic acid provides improved transparency and whitening resistance at moisture absorbing of films without deteriorating their gas barrier properties. However, there is nothing in *Takashima et al* that discloses or even suggests that the combination of the two additives, as claimed, would exhibit the recited improved properties.

As shown above, Applicants have discovered that employing both a first additive and a second additive, as recited in the claims, in a polyamide matrix results in the formation of a thermoplastic composition with **surprising** and **unexpected** results can be attained in the form of good fluidity during processing and mechanical strength.

To establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. As shown above, there is no suggestion or motivation in the cited prior art to combine the references to obtain the claimed composition having the improved properties. While *Takashima et al* teaches that tricarboxylic acid provides improved transparency and whitening resistance at moisture absorbing of films without deteriorating their gas barrier properties, these properties are unrelated to the improved properties of the composition of the instant claims. Therefore, there is no suggestion or motivation in the cited prior art to modify *FR '603* with *Takashima* to obtain the combination of features defined in the pending claims of the instant application.

To establish a *prima facie* case of obviousness, there must also be a reasonable expectation of success. There is no reasonable expectation of success based on the teachings in the cited prior art that the combination of the two additives defined in the claimed composition would result in the claimed improved properties. There would not have been a reasonable expectation of success in obtaining the Applicants' claimed composition when there is no indication in either of the cited references (alone or in combination) that the claimed improved properties would result from the combination of the two claimed additives. Both of the cited references are completely silent concerning these properties. Absent some specific teaching in the cited prior art relating to these properties, one of ordinary skill in the art would not have had a reasonable expectation of success in obtaining the composition with the claimed improved properties. Also, as shown above, the addition of two additives (T2 and T4), both of which are low molecular weight, did not lower the viscosity more than one additive (T2), and, in fact increased the viscosity relative to the presence of the single additive (T2). Therefore, there is no reasonable expectation of success in producing the Applicants' composition based on the teachings in the cited prior art.

To establish a *prima facie* case of obviousness, the prior art reference (or references when combined) must teach or suggest all the claim features. As shown above, there is no teaching in the cited art to combine the two additives required by the claims to obtain a composition with the improved properties where (1) the smooth impact resistance and/or notched impact resistance is greater than compositions having the same composition except for the second additive B, or (2) the composition has a lower viscosity than compositions having the same composition except for the second additive B than compositions having the same composition except for the second additive B. Therefore, the cited prior art does not teach or suggest all the claimed features.

Therefore, claims 25-27, 29, 32,33,35, 36, 38 41, 42 and 45-48 are non-obvious over the applied art. Accordingly, withdrawal of the above §103(a) rejection is respectfully requested.

Conclusion

In view of the foregoing, it is submitted that all claims are in condition for allowance. Should any questions arise in connection with this application or should the Examiner believe that a telephone conference with the undersigned would be helpful in resolving any remaining issues pertaining to this application, the undersigned respectfully requests that he be contacted at the number indicated below.

The Director is hereby authorized to charge any appropriate fees under 37 C.F.R. §§ 1.16, 1.17 and 1.20(d) and 1.21 that may be required by this paper, and to credit any overpayment, to Deposit Account No. 02-4800.

Respectfully submitted,
BUCHANAN INGERSOLL & ROONEY PC

Date: July 13, 2011

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